CLAIMS

1.   A method of global motion estimation between frames of a motion-compensated inter-frame encoded video sequence, each frame of the sequence having a plurality of
5 motion vectors encoded therein relating the frame to a preceding and/or succeeding frame of the sequence, the method comprising, for a particular frame:

a) determining a motion estimation representative of the global motion between the particular frame and its anchor frame on the basis of motion vectors therebetween;

b) determining one or more further motion estimations representative of the
10 global motion between the particular frame and its anchor frame at least partially on the basis of motion vectors between the particular frame and one or more preceding or succeeding other frames; and

c) selecting one of the motion estimations which meets at least one predetermined criterion as being representative of the global motion of the frame.
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2.   A method according to claim 1, wherein the determining step b) further comprises the steps of: ·

e) determining one or more motion estimations representative of the global motion of the frame with respect to one or more respective preceding or succeeding
20 other frames;

f) determining one or motion estimations respectively representative of the global motion of the one or more other frames with respect to the anchor frame; and

g) accumulating the respective motion estimations to give one or more respective overall motion estimations each substantially representative of the global
25 motion of the frame with respect to the anchor frame.

3.   A method according to claims 1 or 2, wherein the selecting step c) further comprises testing the motion estimations in turn; and outputting a motion estimation as being representative of the global motion of the frame if it passes the test, wherein the
30 test is applied in turn to motion estimations once they have been determined, and if the test is passed then no further motion estimations are determined.

4.   A method according to claim 3, wherein the test comprises comparing the motion estimation with a threshold value, wherein the test is passed if the parameters of
35 the motion estimation do not exceed the threshold value.

5.   A method according to any of claims 3 or 4, wherein if the test is failed, the method further comprises:

    interpolating between the motion estimations of adjacent frames to give an
5   interpolated motion estimation which is then output as the motion estimation representative of the global motion of the frame.

6.   A method of generating panoramic images from a motion-compensated inter-frame encoded video sequence, the method comprising:
10   for each frame of the sequence, determining the global motion of each frame with respect to its anchor frame using the method of any of the preceding claims; and

    generating at least one panoramic image representing the frames of the video sequence using the global motion estimations thus determined..

15 7. .   A method according to claim 6, wherein the generating step further comprises:
    selecting a particular frame of the sequence as a reference frame, the plane of the reference frame being a reference plane;

    for each frame other than the reference frame, accumulating the global motion estimations from each frame back to the reference frame;
20   warping each frame other than the reference frame onto the reference plane using the accumulated global motion estimations to give one or more pixel values for each pixel position in the reference plane; and

    for each pixel position in the reference plane, selecting one of the available pixel values for use as the pixel value in the panoramic image.
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8.   A method according to claim 7, wherein the selecting step comprises selecting a substantially median pixel value from the available pixel values for use in a background panoramic image.

30 9.   A method according to claims 7 or 8, wherein the selecting step comprises selecting a substantially most different pixel value from the available pixel values for use in a foreground panoramic image.

10.   A method according to any of claims 7 to 9, wherein the selecting step
35 comprises:

calculating the mean pixel value of the available pixel values;

calculating the L1 distance between each available pixel value and the calculated mean pixel value; and

select the pixel value with the median L1 distance for use in a background

5 panoramic image.

11. A method according to any of claims 7 to 10, wherein the selecting step comprises:

calculating the mean pixel value of the available pixel values;

10 calculating the L1 distance between each available pixel value and the calculated mean pixel value; and

select the pixel value with the maximum L1 distance for use in a foreground panoramic image.

15 12. A computer program or suite of programs arranged such that when executed on a computer system the program or suite of programs causes the computer system to perform the method of any one of the preceding claims.

13. A computer readable storage medium storing a computer program or suite of

20 programs according to claim 12.

14. A system for global motion estimation between frames of a motion-compensated inter-frame encoded video sequence, each frame of the sequence having a plurality of motion vectors encoded therein relating the frame to a preceding and/or succeeding

25 frame of the sequence, the system comprising:

video processing means arranged in use to:

i) determine a motion estimation representative of the global motion between the particular frame and its anchor frame on the basis of motion vectors therebetween;

30 ii) determine one or more further motion estimations representative of the global motion between the particular frame and its anchor frame at least partially on the basis of motion vectors between the particular frame and one or more preceding or succeeding other frames; and

a motion estimation selector means arranged in use to select one of the motion estimations which meets at least one predetermined criterion as being representative of the global motion of the frame.

5   15.   A system according to claim 14, wherein the video processing means is further arranged in use to:

determine one or more motion estimations representative of the global motion of the frame with respect to a one or more respective preceding or succeeding other frames;

10   determine one or motion estimations respectively representative of the global motion of the one or more other frames with respect to the anchor frame; and

accumulate the respective motion estimations to give one or more respective overall motion estimations each substantially representative of the global motion of the frame with respect to the anchor frame.

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16.   A method according to claims 14 or 15, wherein the motion estimation selector means further comprises motion estimation testing means for testing the motion estimations in turn, and providing an indication as to whether the test is passed; and output means arranged in use to output a motion estimation as being representative of

20 the global motion of the frame in dependence on the receipt of an indication that the test was passed from the motion estimation testing means, wherein the motion estimation testing means is further arranged to apply the test in turn to motion estimations once they have been determined, and if the test is passed then no further motion estimations are determined.

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17.   A system according to claim 16, wherein the test comprises comparing the motion estimation with a threshold value, wherein the test is passed if the parameters of the motion estimation do not exceed the threshold value.

30 18.   A system according to any of claims 16 or 17, and further comprising motion estimation interpolation means arranged to interpolate between the motion estimations of adjacent frames to give an interpolated motion estimation, in dependence on the motion estimation testing means indicating that the test has been failed by all the motion estimations determined by the video processing means.

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19.   A system for generating panoramic images from a motion-compensated inter-frame encoded video sequence, comprising:

a system for global motion estimation between frames of a motion-compensated inter-frame encoded video sequence as claimed in any of claims 14 to 18, and further
5   arranged to provide global motion estimations for each frame; and

panoramic image generating means for generating at least one panoramic image representing the frames of the video sequence using the global motion estimations thus determined.

10   20.   A system according to claim 19, wherein the panoramic image generating means is further arranged in use to:

select a particular frame of the sequence as a reference frame, the plane of the reference frame thereby being a reference plane;

for each frame other than the reference frame, accumulate the global motion
15   estimations from each frame back to the reference frame;

warp each frame other than the reference frame onto the reference plane using the accumulated global motion estimations to give one or more pixel values for each pixel in the reference plane; and

for each pixel position in the reference plane, select one of the available pixel
20   values for use as the pixel value in the panoramic image.

21.   A system according to claim 20, wherein the panoramic image generating means is further arranged to select a substantially median pixel value from the available pixel values for use in a background panoramic image.
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22.   A system according to claims 19 or 20, wherein the panoramic image generating means is further arranged to select a substantially most different pixel value from the available pixel values for use in a foreground panoramic image.

30   23.   A system according to any of claims 19 to 22, wherein the panoramic image generating means is further arranged to:

calculate the mean pixel value of the available pixel values;

calculate the L1 distance between each available pixel value and the calculated mean pixel value; and

select the pixel value with the median L1 distance for use in a background panoramic image.

24. A system according to any of claims 19 to 23, wherein the panoramic image
5 generating means is further arranged to:

calculate the mean pixel value of the available pixel values;

calculate the L1 distance between each available pixel value and the calculated mean pixel value; and

select the pixel value with the maximum L1 distance for use in a foreground
10 panoramic image.